

# THE POSTURAL DEVELOPMENT OF INFANTS WITH SPECIAL REFERENCE TO THE DEVELOPMENT OF THE FUNCTION OF WALKING AND PROPER SHOEING †

By CLIFFORD SWEET \*

**N**ERVOUS energy lost, because one must live and work under a handicap, is sheer waste of human values—subtracting from creative ability and diminishing the store one has to spend on the “joy of living” after work is done. True, most of us are comfortable and are therefore satisfied with ourselves, not realizing that we go about our daily tasks carrying the weight of our own bodies at a mechanical disadvantage, which, even though it be small, when multiplied by the active hours of an average lifetime is considerable and when translated into wear and tear must hasten the decline in efficiency of the body.

Those of us who examined recruits and soldiers have a vivid memory of the faulty postures and particularly of the inefficient feet we saw among healthy young adults. Casual observance, while walking the streets or when seated in a public lobby, will bring to your attention the awkward, incorrect, and inefficient gait of almost every adult who passes. The head thrust forward, shoulders drooped to form angel wings, marked lordosis with over-prominent abdomen and buttocks, feet everted and pronated make up the prominent traits of the walking posture. In this posture only one gait is possible: the body is propelled forward in short, jerky movements with a pushing action, taking off from the inner border of the foot. This can be seen more clearly as persons walk from you on the moving picture screen and can be observed in such manner as to remove all doubts of the correctness of the observation when you are five or more stories above pedestrians and looking down directly upon them. Contrast this with the natural gait with its long swinging stride, the foot grasping the ground, pointed at least straight ahead or toeing in, taking off over the ends of the toes and the body propelled forward by the powerful pull of the thigh flexors, lifted by the even more powerful calf group with a smooth elastic movement made possible by functioning and well-developed arch muscles, and you begin to have a conception of the loss sustained in efficiency and grace of movement by the average individual.

After we began, some years ago, to scan carefully every child with reference to his posture we noticed: (1) that faulty posture was rare in young infants, while very common in older children, especially in the pre-school group; (2) that with the faulty pos-

ture of the older group went almost constantly certain deformities of the feet and deflection of the weight-bearing line in its foot to leg passage.

The infant stands in such manner as to gain greatest stability, that is, with his joints locked in a position of rest. Stability is the one essential of his upright position. His first steps are taken, maintaining this, and propelling himself forward by swaying his entire body from side to side and planting his feet forward successively by a swing of the leg. As stability increases and co-ordination of nerve muscle impulses is learned, the gait changes to that described above as the natural gait, unless the natural order of development is interfered with.

The first factor interfering with development is heredity. The individual whose inheritance gives him poor general muscular equipment easily falls into faulty posture or develops inferior methods of movement, even though his environment be good. Also the child with a congenital unbalance of one or more muscle groups is handicapped unless special education is directed toward the improvement of his inherited condition; this we see very frequently, for example, in families, several of whose members have a congenitally weak calf group. Because of this weakness, walking is begun late, the infantile method of standing and walking is continued relatively late into childhood and eversion and pronation of the feet become permanent unless proper corrective measures are begun early and carried on long enough to produce permanent results.

Next nutrition plays a most important part. If at any time during the growing period rickets is allowed to develop, deformity of some degree results. Rickets always produces not bony weakness alone, but muscular weakness as well, and all growing children develop some degree of rickets, unless proper food, sun baths and cod liver oil are supplied in adequate amounts. Acute illness with its attendant drop in nutritional state and muscular vigor often forms the basis of faulty posture or gait. Muscles that are perhaps able to hold their own under favorable conditions, lose ground even during a short illness and may not be able to regain power enough to re-establish balance unless assisted. Therefore, after all acute illness, rest should be enforced long enough to permit a return to a state of nutrition that is near normal, and any observed faults should be corrected before gaining permanence.

These general considerations are discussed that we may appropriately evaluate them in considering our broader problem. However, they do not explain the prevalence of eversion and pronation of the feet in children after infancy is passed. This fault is almost universal or so nearly so that there must be some fundamental, generally prevailing cause for it.

For several years before I arrived at my present views, correction was attempted by elevating and advancing the inner border of the heels. This is a very satisfactory procedure and, if continued long enough, produces good results. During this time I questioned every one I met who might possess special knowledge on the subject without obtaining explanations that were altogether satisfactory. The explanation most often given was that the individual had an overactive and overstrong calf group. This was found to be true in the great majority of chil-

† Address as Chairman of the Section on Pediatrics, 1926 Session, California Medical Association, Oakland.

\* Clifford Sweet (242 Moss Avenue, Oakland). M. D. University of California, 1912; B. S. University of California, 1909; M. S. University of California, 1912. Graduate study: University of California Hospital, 1912; Harvard Medical School and Massachusetts General Hospital, 1913. Previous honors: M. C., U. S. A., 1918-19. Present hospital connections: Baby Hospital, Oakland, and Fabiola Hospital, Oakland. Scientific organizations: Alameda County Medical Society, California Medical Association, American Medical Association, and California Academy of Medicine. Practice limited to diseases of children since 1919.

dren, but the fact still left unanswered the question of "Why Is the Calf Group Overdeveloped and Overactive?" We now believe the answer is in the following observations:

The normal infant's foot is broad anteriorly, the toes being well separated, the space being widest between the great toe and its neighbor. The great toe, standing separate from the rest, forms an adequate support for the mesial border of the foot, thereby preventing pronation.

Very early in childhood this type of foot becomes a rarity and we have in its stead a foot much more nearly approaching the deformed adult foot. That is, the toes are crowded together and the great toe no longer has a straightforward or even a forward-mesial direction, but is angulated more or less sharply laterally; thus it no longer supports the inner border of the foot and pronation results. This deformity is produced almost, if not entirely, by short socks and short shoes. The short sock and the short shoe force the great toe laterally, often almost to the midline of the foot and, in the plastic foot of the child, the new alignment soon becomes permanent. Ninety per cent of all our children patients are in socks that are too short and 75 per cent in shoes that are too short. A walk through a schoolyard reveals that nearly all the children are in shoes that are too short or too narrow, or both. When standing with the full weight borne on the feet, the sock should allow the foot to stretch to full length and the shoe should be long enough to make the arch of the shoe and the arch of the foot correspond.

A short sock and a short shoe compel anyone to stand and walk with the feet everted and pronated in order to release the toes from being caught between the weight thrust of the body and the confining covering. Because this is so, "Short Socks and Shoes" is a frequent diagnosis as the small patient walks into the office. His everted and pronated feet tell his story—even though he has not complained; incidentally, no child under the age of seven will make verbal complaint of his footwear. So when I say to the mother, "Your child's shoes are too short," she answers in surprise, "He hasn't said a word about it so I had not thought of it." Often, too, when this information is given her, she promptly seats him on the examining table and says, "You are mistaken, they are plenty long enough." When the child is seated, she is right, they are long enough for the relaxed foot, but when standing they are not long enough for the extended foot.

Correction of the short sock and short shoe and correction of the weight-bearing line by elevation of the inner border of the heel still left me dissatisfied. We were evidently not at the full solution of the problem. Our small patients were still everting their feet and taking off from the inner border of the foot when wearing shoes. It wasn't until they were allowed to walk barefooted that the natural gait was assumed and this last observation led me about two years ago to advise a flexible-soled or moccasin type of shoe for all infants, and I now advise its continuance up to at least three or four years of age. This advice was received with much opposition by mothers because the custom always has been to put

the child upon a stiff sole as soon as he begins walking in order to support his feet. Here again custom has some warrant in fact. So long as stability while standing or walking in the infantile manner is the only consideration, the wide firm sole is of value. But the instant the child begins to develop the function of walking, the hard sole definitely prevents the development of this function. Here as elsewhere interference with function produces in time abnormality. The child, as yet unstable and with untrained muscles, cannot raise himself over the end of the hard sole, so must of necessity take off from the inner border with the feet everted. On the other hand, in the flexible-soled shoe the foot develops its grasping power, the take-off is over the ends of the toes (as the worn soles of this type of shoe will prove) and since the inner border of the foot is longer than the outer, the natural toe-in position is assumed.

Great joy comes as one watches the child walk naturally and gracefully. It is a pleasure to watch the lithe grace of the little ones literally walking on the toes, proving that the arch is being developed by use, that the tibialis anticus and the tibialis posticus are holding their own, gaining by development a foundation that even the future onslaughts of the calf group, aided and abetted by years of fashionable heels and soles, can't entirely wreck.

In conclusion, your attention is invited to the fact that neither in standing or walking can the body posture be correct when there is an abnormal relationship between the body and its supporting structures, the feet. Pronated and everted feet mean overstrained lower legs; inward rotation of the femurs on the pelvis; lordosis with over-prominent hips and abdomen; anterior curvature of the dorsal spine with its attendant forward thrust of the head; the very postural faults that are so lamentably common.

Finally, such work as this, faithfully carried out, belongs to the physician. In carrying it out, he must give much of himself without immediate material gain, but he gains the consciousness within himself that he is making permanent contribution to the welfare of the race.

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**The spiritual part of life is the substance, the temporal part is the reflection of it.** Turn it the other way around and it does not work. The spirit is the master of the body. If one is in a state of spiritual health he is in a condition highly conducive to physical health. That is much more nearly true than to say if he is in a state of physical health he is necessarily in a condition conducive to spiritual health, for one may be very healthy physically and bad spiritually, and he may be very unhealthy physically for some reason, and still pretty good spiritually. But still it remains that, of the two states, the state of spiritual health is more important than the other, and more conducive to every sort of well-being.—Edward S. Martin, Harper's Magazine.

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**Jesus was not, in the strict sense of the word, a social reformer.** Instead of urging legislation or preaching social revolution, He contented Himself with arousing a new conscience that would itself gradually solve the problems. Indeed, the strength and power of His work lay in this very fact, that He declined to advocate specific reforms. He did something better; He set forth large principles which made reform inevitable.—Rt. Rev. Charles Fiske, D. D., Harper's Magazine.